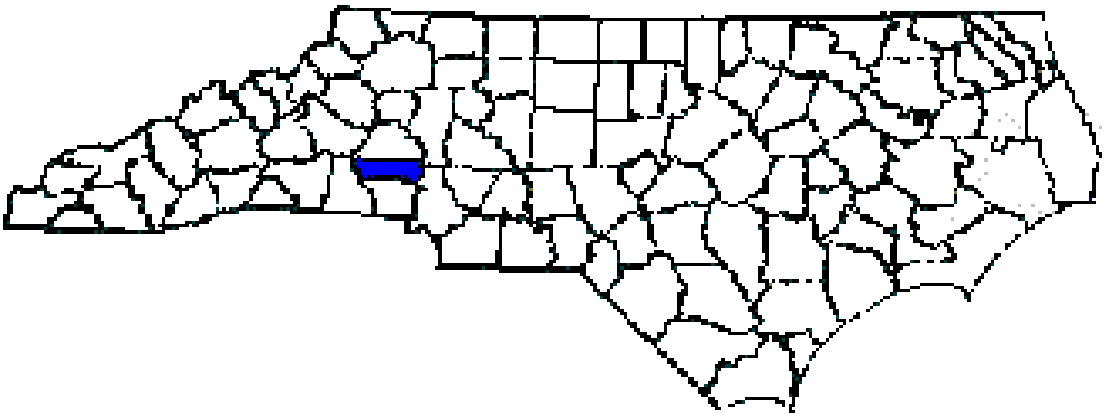
ANNUAL REPORT FOR 2012



UT to Forney Creek
Lincoln County
TIP No. R-2206B
COE Action ID: 200431320
DWQ WQC #: 3476

Prepared By:
Roadside Environmental Unit & Natural Environment Unit
North Carolina Department of Transportation
March 2012

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SUMMARY

The following report summarizes the stream monitoring activities that have occurred during 2012 at the UT to Forney Creek Mitigation Site in Lincoln County. The site was constructed during 2008 by the North Carolina Department of Transportation (NCDOT). This report provides the monitoring results for the fifth formal year of monitoring (Year 2012). The Year 2012 monitoring period is the fifth of five scheduled years for monitoring on UT to Forney Creek Mitigation Site (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring along UT to Forney Creek, the site has met the required monitoring protocols for the fifth formal year of monitoring. Based on comparing the five years of monitoring data, the channel is stable. In late October/early November 2011, the eroded section of the channel near the culvert was repaired by shifting the alignment of the channel to the south onto the low bench that had formed. Two cross-vanes were installed for grade control due to the elevation difference between the upstream existing cross-vane and the culvert invert. Boulder toe protection was used on the left hand bank (looking downstream) to help stabilize the bank. A previously noted crossvane just upstream of Photo Point #3 that had water piping under the structure and a slight headcut had formed was also repaired with hand tools. The repaired area was replanted with live stakes and bareroot seedlings in February 2012. The streambank and buffer are vegetated for the fifth year of monitoring.

NCDOT proposes to continue stream monitoring at the UT to Forney Creek Mitigation Site for summer of 2012.

1.0 INTRODUCTION

1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during 2012 at the UT to Forney Creek Mitigation Site. The site is located adjacent to the NC 16 Bypass southbound lanes just south of SR 1380 Saint James Church Road (Figure 1). The UT to Forney Creek Mitigation Site was constructed as asset mitigation for future projects.

The mitigation project covers approximately 140 meters (459 linear feet) of stream restoration. Construction was completed in March 2008 by the NCDOT. Stream restoration involved draining an existing pond, construction of a new stream channel, installation of rock cross vanes, and construction of the floodplain to allow for overbank flooding. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area.

1.2 Purpose

In order for a mitigation site to be considered successful, the site must meet the success criteria. This report details the monitoring in 2012 at the UT to Forney Creek Mitigation Site. Hydrologic monitoring was not required for the site.

1.3 Project History

March 2008	Construction Completed
November 2007	Stream Channel Survey Monitoring-Winter Report (Initial)
March 2008	Replanted Live Stakes and Bareroot Seedlings
March 2008	Stream Channel Visual Monitoring-Winter Report (Year 1)
April 2008	Stream Channel Survey Monitoring-Spring Report (Year 1)
September 2008	Stream Channel Visual Monitoring-Summer Report (Year 1)
March 2009	Stream Channel Visual Monitoring-Winter Report (Year 2)
August 2009	Stream Channel Visual Monitoring-Summer Report (Year 2)
February 2010	Stream Channel Survey Monitoring-Winter Report (Year 3)
September 2010	Stream Channel Survey Monitoring-Summer Report (Year 3)
February 2011	Stream Channel Survey Monitoring-Winter Report (Year 4)
June 2011	Stream Channel Survey Monitoring-Summer Report (Year 4)
Oct./Nov. 2011	Repaired Lower End of Stream
January 2012	Stream Channel Survey Monitoring-Winter Report (Year 5)
February 2012	Replanted Lower End of Stream

1.4 Debit Ledger

The entire UT Forney Creek stream mitigation site was upfront stream mitigation. This site will be used, with regulatory approval, to offset future impacts in the Catawba River basin.

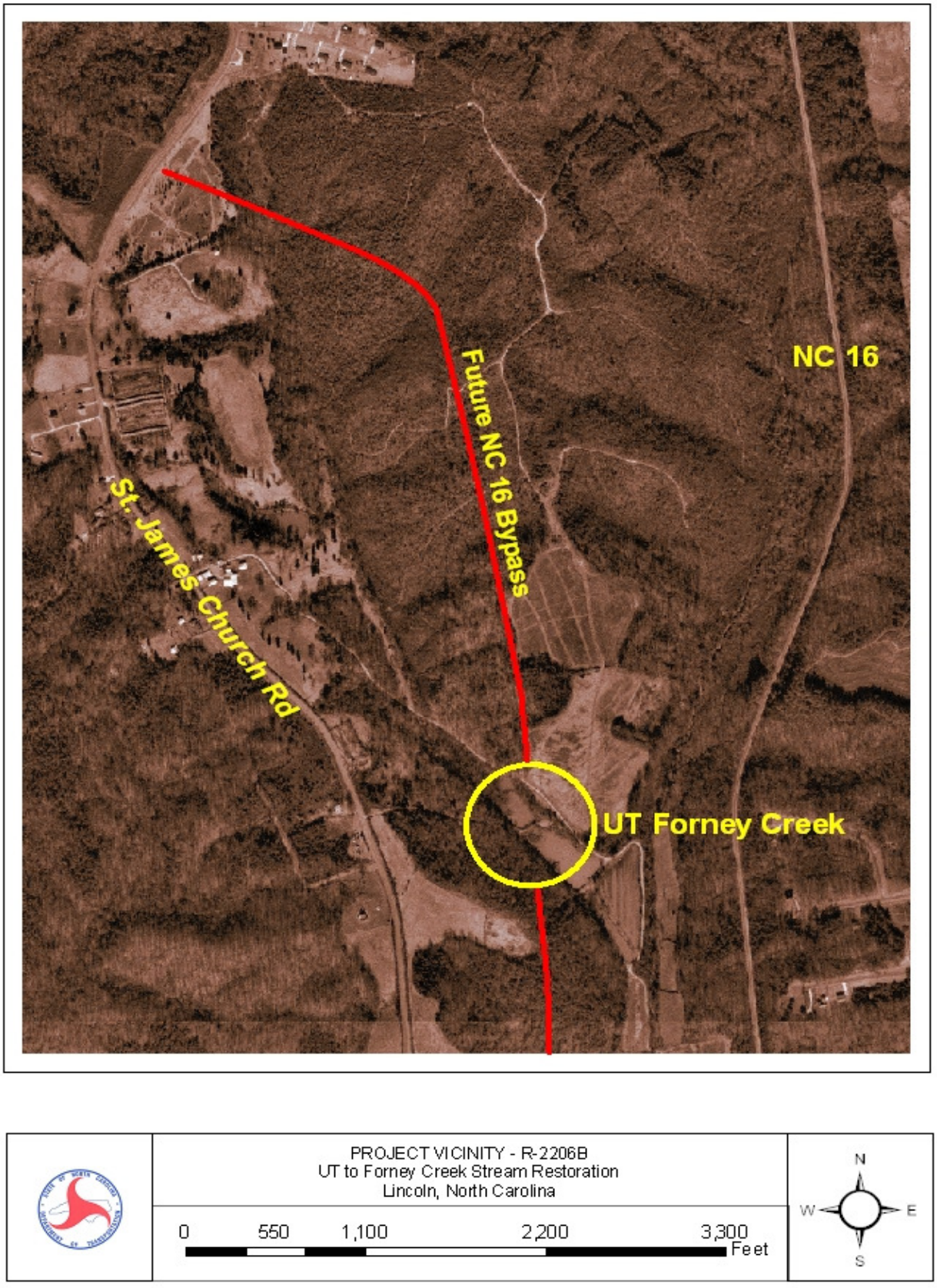


Figure 1. Vicinity Map

2.0 STREAM ASSESSMENT

2.1 Success Criteria

In accordance with an email from DWQ dated July 23, 2008 the site will be monitored visually twice a year (summer and winter) for Years 1 through 5. In addition, the stream will be surveyed (longitudinal profile and cross sections) during Years 1, 3, and 5.

Vegetation Success
The success of vegetation plantings will be visually inspected during the summer evaluations.

2.2 Stream Description

2.2.1 Post-Construction Conditions

The mitigation project covers approximately 140 meters of stream restoration. Construction was completed in March 2008 by the North Carolina Department of Transportation (NCDOT). Stream restoration involved draining an existing pond, construction of a new stream channel, installation of rock cross vanes, and construction of the floodplain to allow for overbank flooding. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area.

2.2.2 Monitoring Conditions

The objective of the UT to Forney Creek Mitigation Site restoration was to build a C5 stream type as identified in the Rosgen's Applied River Morphology. A total of six cross sections (four in a riffle, two in a pool) were surveyed. For this report, only cross sections containing riffles were used in the comparison of channel morphology in Table 1.

Table 1. Abbreviated Morphological Summary (UT to Forney Creek Cross Sections #2, #3, #5, and #6)						
Variable	**Proposed**	**Cross Section #2 (Riffle)**	**Cross Section #3 (Riffle)**	**Cross Section #5 (Riffle)**	**Cross Section #6 (Riffle)**	**Min. - Max Values (Riffle Sections Only)**
		2012	**2012**	**2012**	**2012**	**2012**
Drainage Area (km^2)	1.00	1.00	1.00	1.00	1.00	1.00
Bankfull Width (m)	4.11	2.9	2.76	3.83	4.93	2.76 – 4.93
Bankfull Mean Depth (m)	0.35	0.36	0.3	0.29	0.17	0.17 – 0.36
Width/Depth Ratio	11.84	8.06	9.2	13.21	29	8.06 – 29
Bankfull Cross Sectional Area (m^2)	1.43	1.06	0.84	1.1	0.83	0.83 – 1.1
Maximum Bankfull Depth (m)	0.45	0.84	0.67	0.69	0.56	0.56 – 0.84
Floodprone Area (m)	21.7	12	14	16	15	12 – 16
Entrenchment Ratio	5.28	4.14	5.08	4.17	3.04	3.04 – 5.08

*Drainage Area, Floodprone Width, and Slope are averaged values only.
*Riffle values are used for classification purposes.

2.3 Results of the Stream Assessment

2.3.1 Site Data

The assessment included the survey of six cross sections and the longitudinal profile of UT to Forney Creek established by the NCDOT after construction. The length of the profile along UT to Forney Creek was approximately 80 meters. Six cross sections were established during the 2007 monitoring year. Cross section locations were subsequently based on the stationing of the longitudinal profile and are presented below. The location of the cross sections and longitudinal profile are shown in Appendix A.

- Cross Section #1. UT to Forney Creek, Station 17+00 meters, midpoint of pool
- Cross Section #2. UT to Forney Creek, Station 30+45 meters, midpoint of riffle
- Cross Section #3. UT to Forney Creek, Station 39+60 meters, midpoint of riffle
- Cross Section #4. UT to Forney Creek, Station 54+10 meters, midpoint of pool
- Cross Section #5. UT to Forney Creek, Station 62+60 meters, midpoint of riffle
- Cross Section #6. UT to Forney Creek, Station 72+70 meters, midpoint of riffle

Based on comparisons of the five years of monitoring data, all six cross sections appear stable with little or no active bank erosion. Graphs of the cross sections are presented in Appendix A. Future survey data will vary depending on actual location of rod placement and alignment; however this information should remain similar in appearance. In late October/early November 2011, the eroded section of the channel near the culvert was repaired by shifting the alignment of the channel to the south onto the low bench that had formed. Two cross-vanes were installed for grade control due to the elevation difference between the upstream existing cross-vane and the culvert invert. Boulder toe protection was used on the left hand bank (looking downstream) to help stabilize the bank. A previously noted crossvane just upstream of Photo Point #3 that had water piping under the structure and a slight headcut had formed was also repaired with hand tools. The repaired area was replanted with live stakes and bareroot seedlings in February 2012.

2.4 Results of Stream and Buffer Vegetation

2.4.1 Description of Species

The following live stake species were planted on the streambank:

Salix nigra, Black Willow

Cornus amomum, Silky Dogwood

The following tree species were planted in the buffer area:

Quercus lyrata, Overcup Oak

Platanus occidentalis, American Sycamore

Fraxinus pennsylvanica, Green Ash

Betula nigra, River Birch

2.4.2 Results of Vegetation Monitoring

Site Notes: Planted vegetation was dormant at the time of monitoring. The lower end that was reconstructed was replanted with live stakes and bareroot seedlings in February 2012.

2.4.3 Conclusions

NCDOT proposes to continue monitoring the vegetation at the UT to Forney Creek Mitigation Site in the summer of 2012.

3.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

The UT to Forney Creek Mitigation Site has met the required monitoring protocols for the fifth formal year of monitoring. The channel and structures within the stream are stable. The streambank and buffer is vegetated for the fifth year of monitoring. NCDOT proposes to continue stream monitoring at the UT to Forney Creek Mitigation Site for the summer of 2012.

4.0 REFERENCES

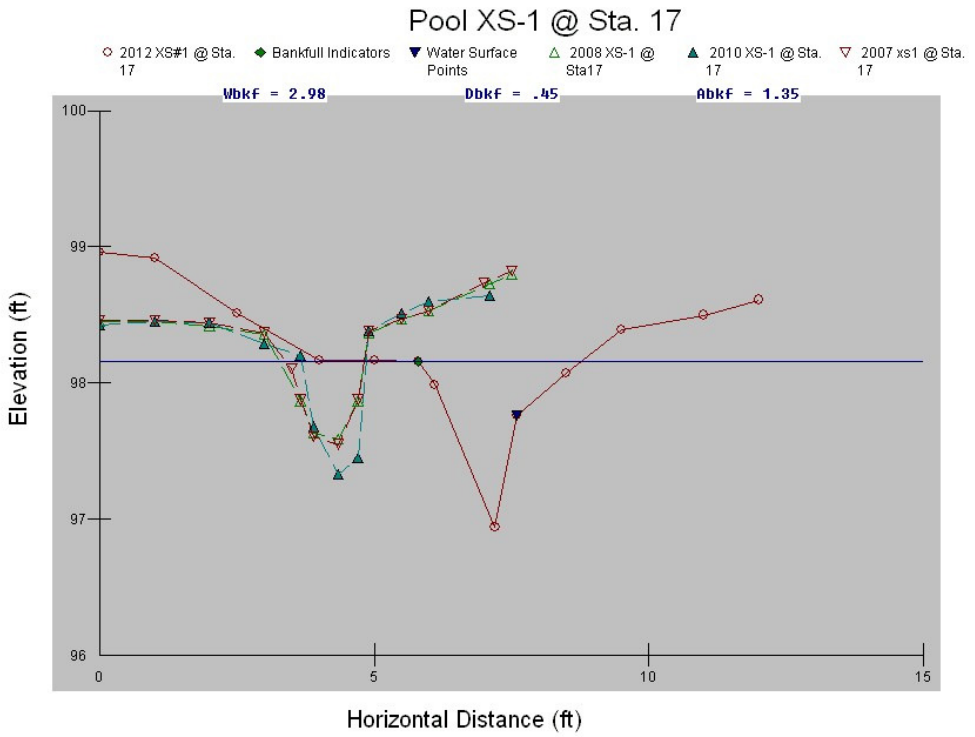
Stream Mitigation Plan for UT to Forney Creek (Permit Site 10B); Lincoln County, NC, COE: October 1, 2004, DWQ: September 21, 2004.

Rosgen, D.L, 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

US Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines. Prepared with cooperation from the US Environmental Protection Agency, NC Wildlife Resources Commission, and the NC Division of Water Quality.

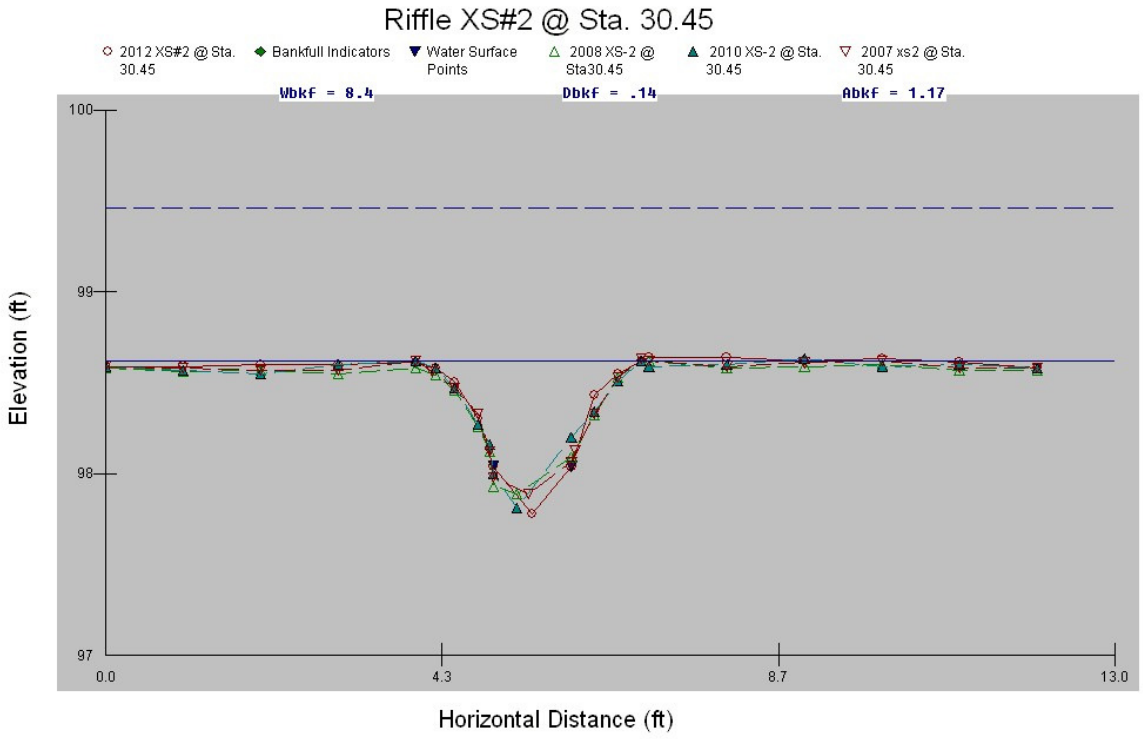
APPENDIX A

CROSS SECTION COMPARISONS
&
LONGTITUDINAL PROFILE

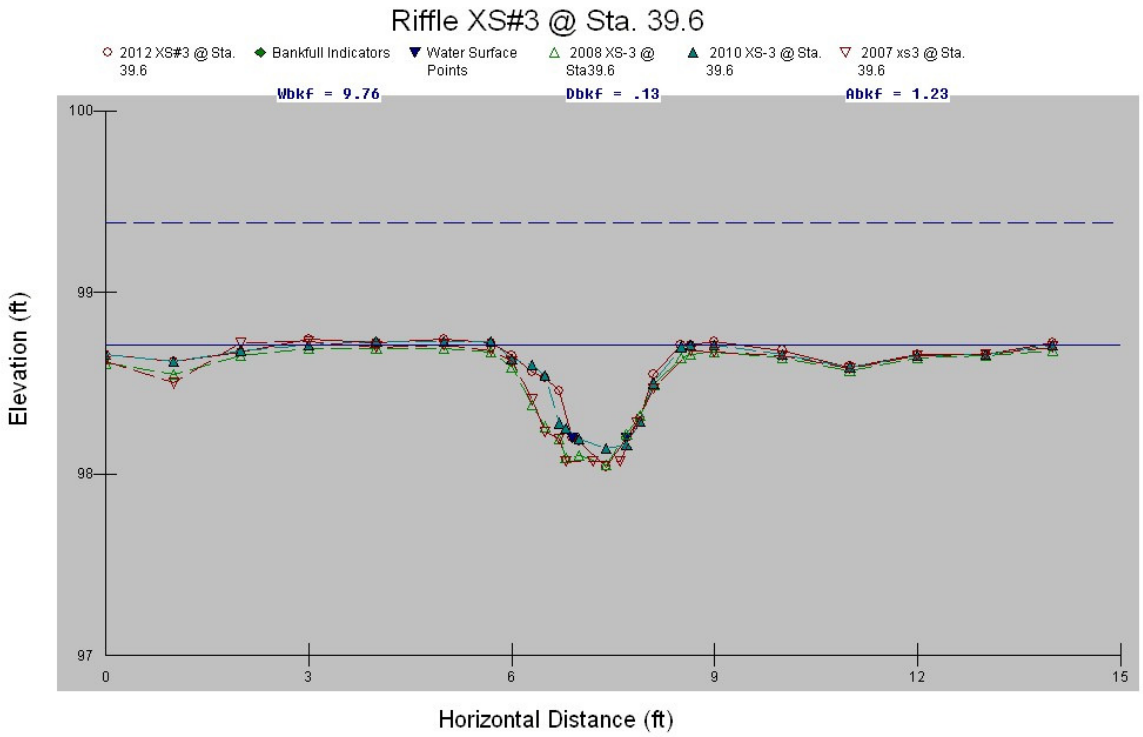


2012 XS#1 @ Sta. 17 shows re-graded channel

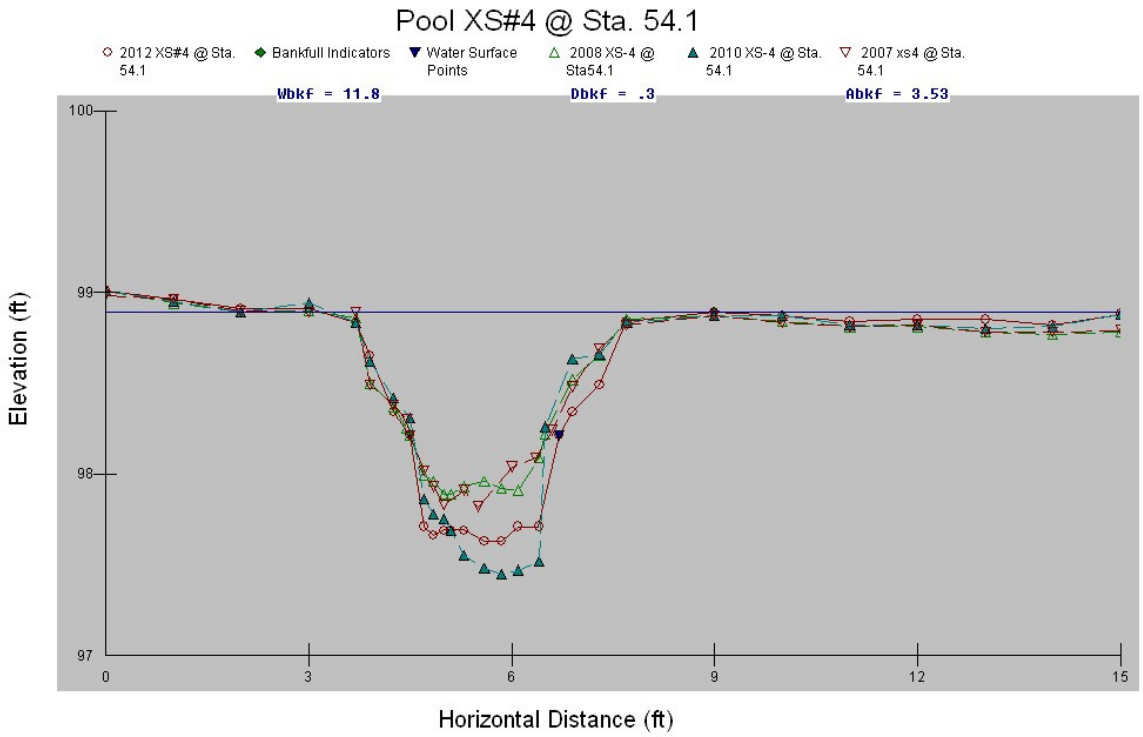
	2007	2008	2010	2012
Bankfull Width (m)	1.9	1.9	3.43	2.98
Bankfull Mean Depth (m)	0.46	0.48	0.35	0.45
Width/Depth Ratio	4.13	3.96	9.8	6.62
Bankfull Cross Sectional Area (m^2)	0.87	0.92	1.19	1.35
Maximum Bankfull Depth (m)	0.82	0.77	1.11	1.22
Width of the Floodprone Area (m)	7.5	7.5	7.1	12
Entrenchment Ratio	3.95	3.96	2.07	4.03



	2007	2008	2010	2012
Bankfull Width (m)	2.87	2.77	2.9	2.9
Bankfull Mean Depth (m)	0.36	0.34	0.35	0.36
Width/Depth Ratio	7.97	8.15	8.29	8.06
Bankfull Cross Sectional Area (m^2)	1.05	0.95	1.02	1.06
Maximum Bankfull Depth (m)	0.73	0.69	0.81	0.84
Width of the Floodprone Area (m)	12	12	12	12
Entrenchment Ratio	4.18	4.34	4.14	4.14

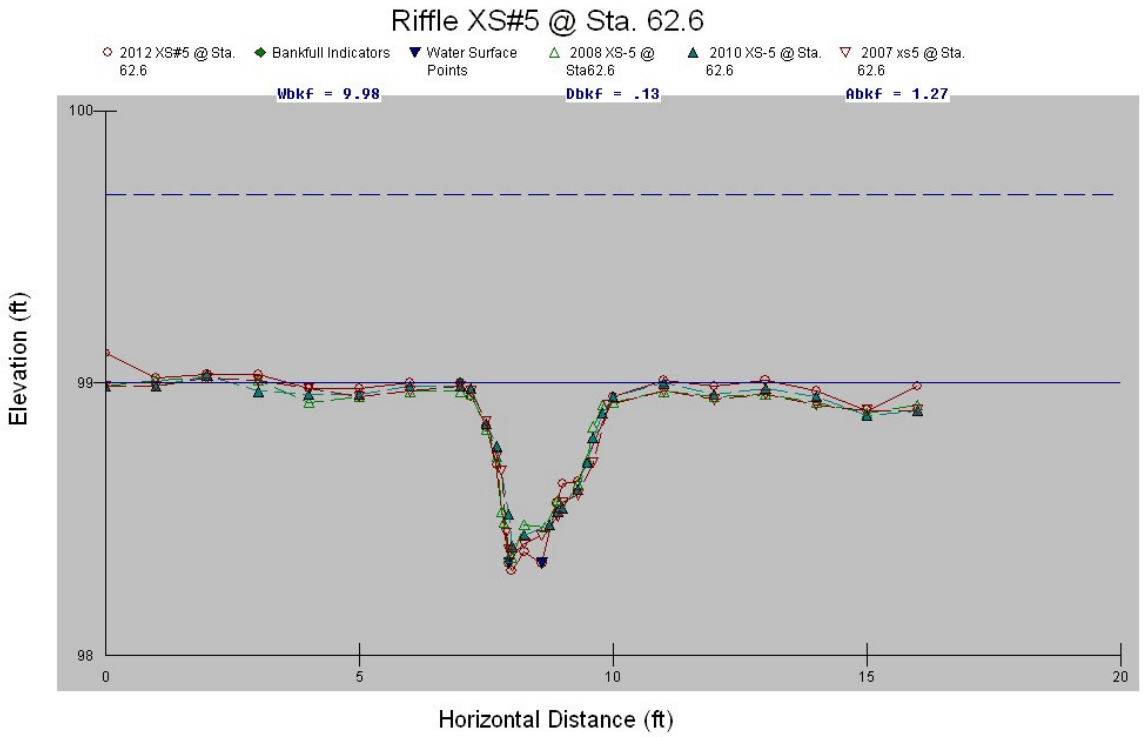


	2007	2008	2010	2012
Bankfull Width (m)	2.95	2.76	2.89	2.76
Bankfull Mean Depth (m)	0.35	0.13	0.3	0.3
Width/Depth Ratio	0.61	8.12	9.63	9.2
Bankfull Cross Sectional Area (m^2)	1.03	1.22	0.86	0.84
Maximum Bankfull Depth (m)	0.61	0.61	0.57	0.67
Width of the Floodprone Area (m)	14	14	14	14
Entrenchment Ratio	4.75	5.07	4.84	5.08

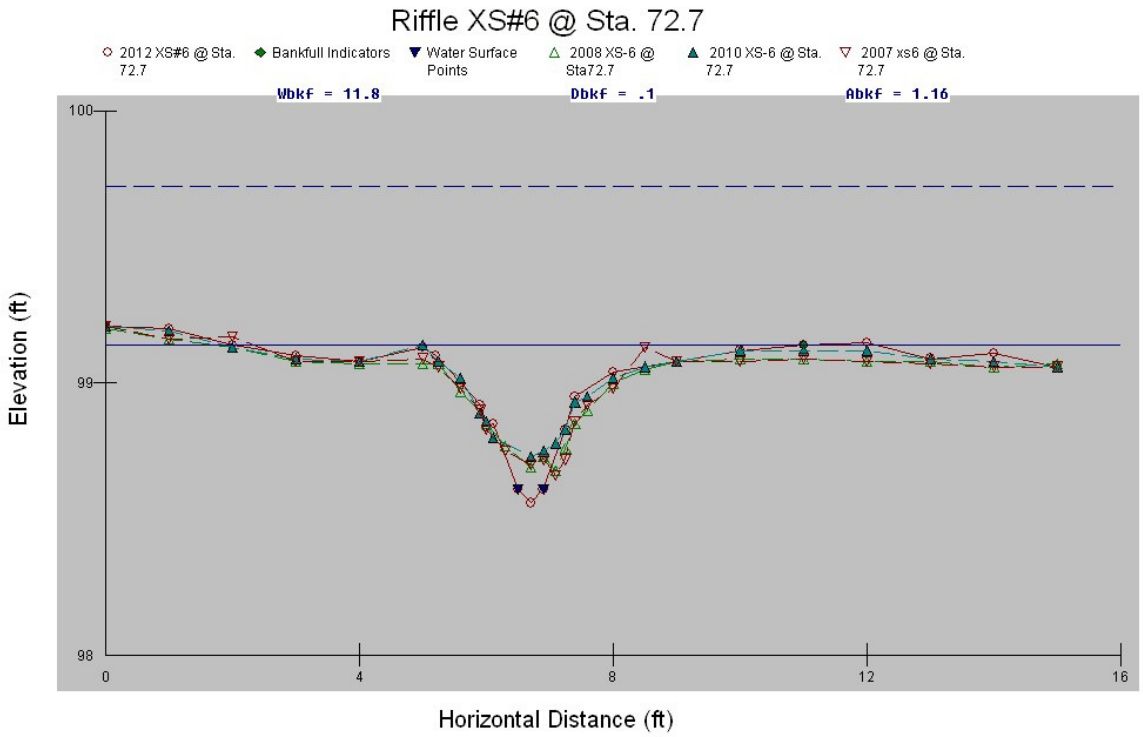


Cross-Section #4 (Pool) Abbreviated Morphological Summary*				
	2007	2008	2010	2012
Bankfull Cross Sectional Area (m^2)	2.3	2.51	3.08	3.3
Maximum Bankfull Depth (m)	1	0.98	1.42	1.26
Bankfull Mean Depth (m)	0.58	0.47	0.58	0.57
Bankfull Width (m)	3.96	5.3	5.3	5.83

* According to the Rosgen Classification of Natural Rivers floodprone width, entrenchement ratio, and width depth ratio are not measured in pool, glide, or run features.

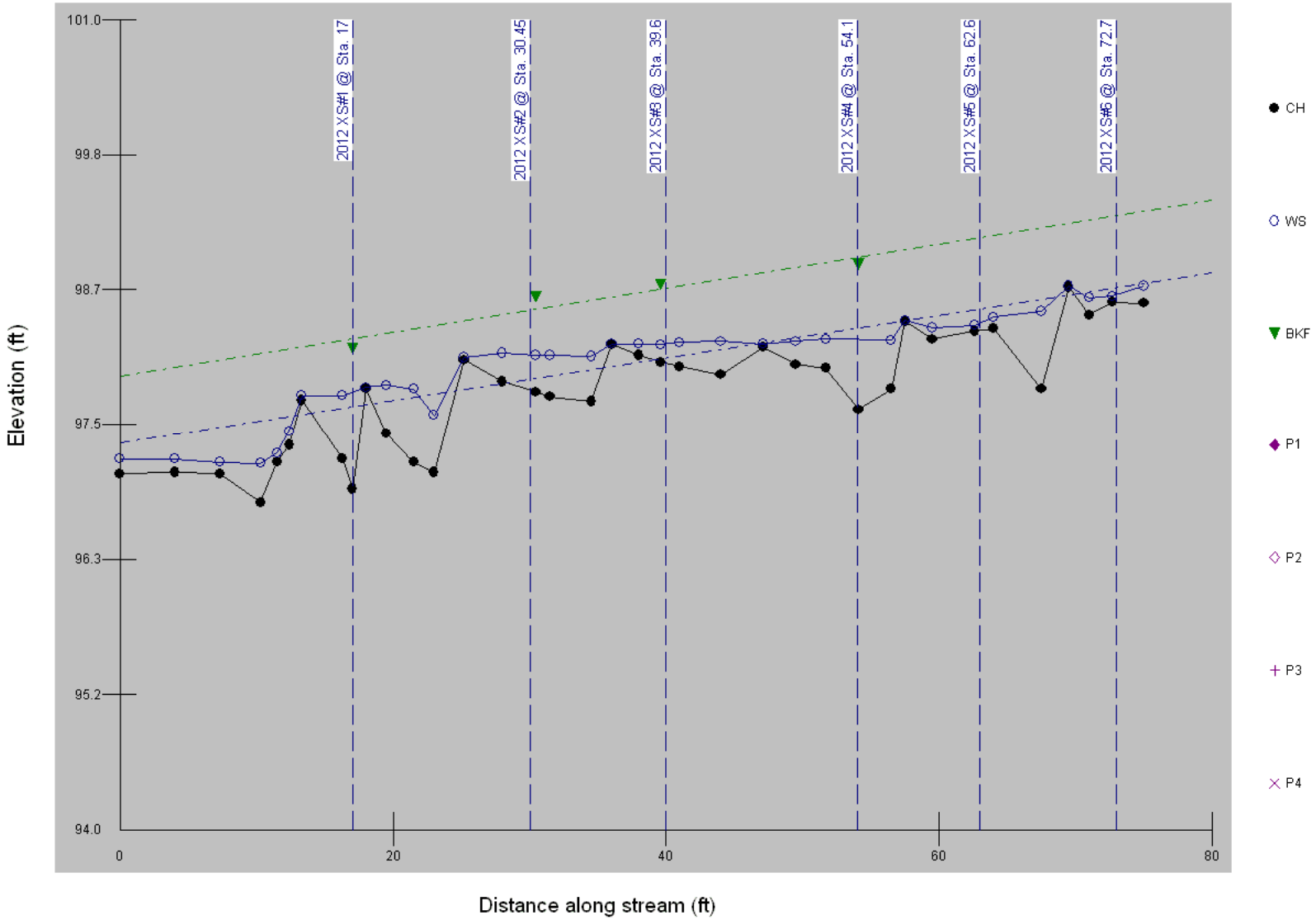


	2007	2008	2010	2012
Bankfull Width (m)	2.55	2.6	2.8	3.83
Bankfull Mean Depth (m)	0.33	0.35	0.34	0.29
Width/Depth Ratio	7.73	7.43	8.24	13.21
Bankfull Cross Sectional Area (m^2)	0.83	0.9	0.95	1.1
Maximum Bankfull Depth (m)	0.55	0.61	0.59	0.69
Width of the Floodprone Area (m)	16	16	16	16
Entrenchment Ratio	6.27	6.15	5.71	4.17



	2007	2008	2010	2012
Bankfull Width (m)	3.34	3.58	4.92	4.93
Bankfull Mean Depth (m)	0.21	0.18	0.15	0.17
Width/Depth Ratio	15.9	19.89	32.8	29
Bankfull Cross Sectional Area (m^2)	0.71	0.64	0.75	0.83
Maximum Bankfull Depth (m)	0.43	0.39	0.39	0.56
Width of the Floodprone Area (m)	15	15	15	15
Entrenchment Ratio	4.49	4.19	3.05	3.04

UT Forney Creek Longitudinal Profile



APPENDIX B

SITE PHOTOGRAPHS, CROSS SECTION AND

PHOTO POINT LOCATIONS

UT to Forney Creek

Photo Point #1 (Upstream)

Photo Point #1 (Downstream)

Photo Point #2 (Upstream)

Photo Point #2 (Downstream)

Photo Point #3 (Upstream)

Photo Point #3 (Downstream)

January 2012

UT to Forney Creek

Photo Point #4 (Upstream)

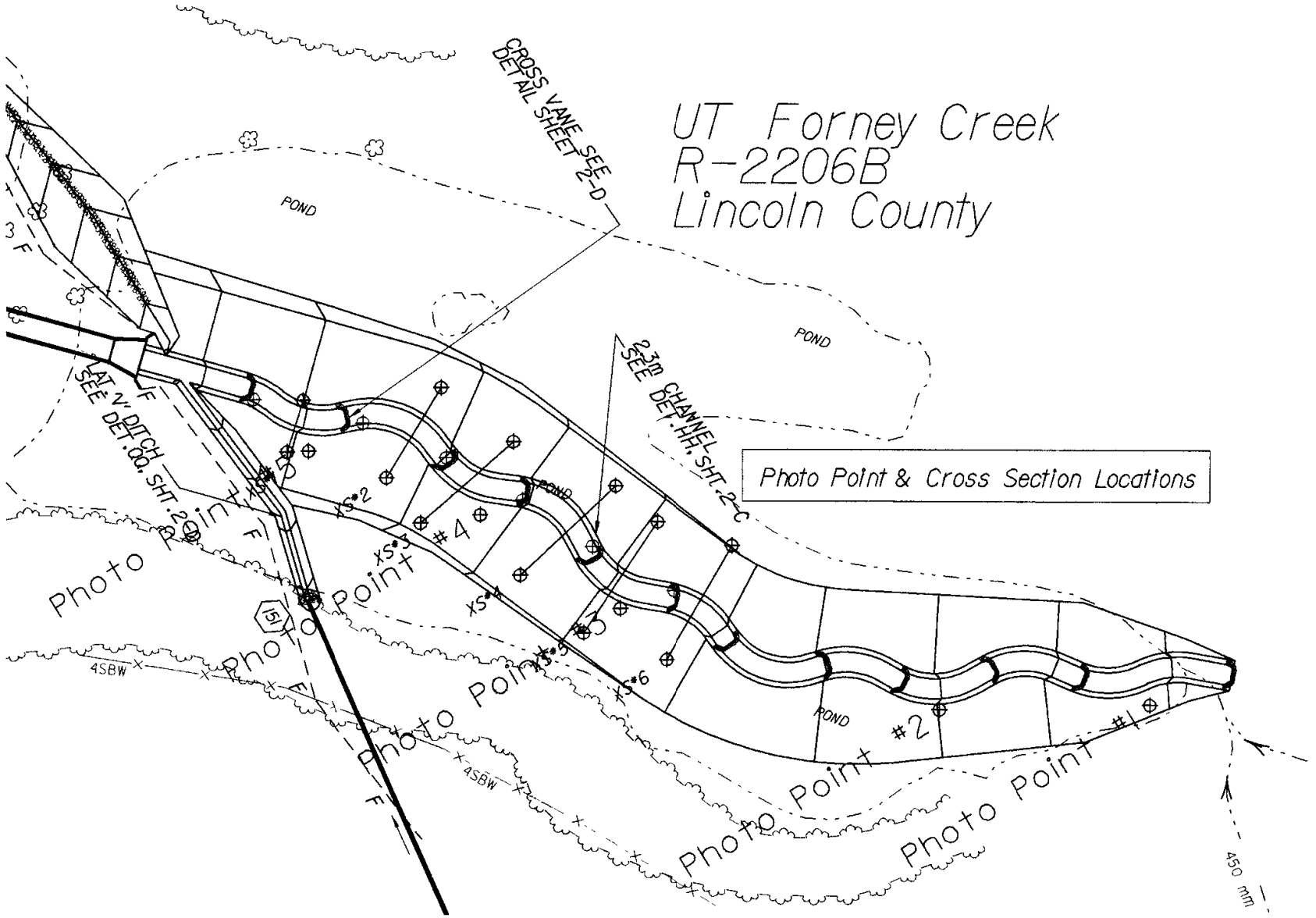
Photo Point #4 (Downstream)

Photo Point #5 (Upstream)

Photo Point #5 (Downstream)

Repaired area at Cross Section #1
January 2012

Looking upstream at repaired area at Cross Section#1


UT Forney Creek
R-2206B
Lincoln County
Photo Point & Cross Section Locations
CROSS VANE SEE DETAIL SHEET 2-D
SEE 3rd CHANNEL HH, SHT. 2-C
SEE LAT V DITCH DET. 00, SHT. 2-D
POND
POND
POND
POND
Photo Point #1
Photo Point #2
Photo Point #3
Photo Point #4
Photo Point #5
Photo Point #6
XS #1
XS #2
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